INTEROPERABILITY

Internet Addresses Have Too Much Class

The most crucial issue in the Internet today is routing and addressing. The combination of not enough addresses and burgeoning routing tables are threatening to implode the network. Here's a cocktail party version of the issues involved.

The Internet Protocol includes a 32-bit address field, room for 4.2 billion addresses. You can't use all the potential addresses though, or you don't have much of a network. Routing protocols are used by a router to "announce" to other routers which hosts can be reached. If each node gets a unique address given out at random, like with Ethernet addresses, each host has to be individually announced and, in the worst case, routers have to schlepp around 4.2 billion route announcements.

To avoid the problem of unmanageable routing tables, the IP address is split into a network number and a host number. Instead of telling each other about available hosts, routers announce which networks they know about.

The trick is to balance the split between the network and host numbers. If the network number uses a lot of bits, then you can have lots of networks, but each one can have only a few hosts. For IP, the Network Information Center assigns three classes, or types, of network addresses. Class A networks support 16 million hosts, but the large host space means that there are only 126 available Class A networks, of which 46 have already been assigned.

Class B networks support 65,534 hosts. Because the network address is larger, there are 16,256 possible Class B networks. Class C networks support only 255 hosts, but there are several million available Class C network numbers.

Here's the problem. Most networks are, or plan to be, bigger than 255 nodes. Everybody wants the flexibility of a Class B address, but there are 5,400 already assigned and the figure is doubling every year.

Simple math shows that we will, given current trends, run out of Class B space sometime in 1993. Moreover, routing tables are getting huge, with more than 5,000 networks announced on the National Science Foundation's NSFNet backbone.

A proposed solution is known as Classless Inter-Domain Routing (CIDR). Organizations would be allocated a block of Class C network numbers instead of a single Class B address. Just giving lots of Class C addresses would compound the routing table problems, so inter-domain routing protocols would be modified to use variable-length network addresses. With intelligent assignment of blocks of Class C addresses to a service provider, which then allocates them to an organization, a single prefix for the service provider can be announced instead of lots of individual numbers.

CIDR is currently under consideration by the Internet Engineering Task Force and the Internet Architecture Board. Even if CIDR is adopted though, IP will have to move to a wider space sooner or later, and how to do so is the subject of heated debate. ■

CARL MALAMUD is writing Exploring the Internet: A Technical Travelogue, *a book that will be featured as The Interop Book at Interop Fall. The opinions expressed are his own.*

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